

ORIGINAL ARTICLE

The Physiological Effects of ASMR on Anxiety

Sahar Seifzadeh ^{1*} , Vahid Asayesh ^{2,3}, Majid Torabi Nikjeh ^{2,3}, Mahdi Dehghani ², Elham Rabbani Parsa ⁴, Fatemeh Asgharianasl⁵

¹ Gdańsk University of Technology, Faculty of Electronics, Telecommunications and Informatics, Multimedia Systems Department, BioTechMed Center, Gdańsk, Poland

² Asayesh Psychiatric Clinic, Tabriz, Iran

³ NPCindex Research Company, Tabriz, Iran

⁴ Department of Psychology, Cognitive Psychology, Semnan University, Semnan, Iran

⁵ Department of Cognitive Neuroscience, University of Tabriz, Tabriz, Iran

*Corresponding Author: Sahar Seifzadeh
Email: Sahar.seifzadeh@pg.edu.pl

Received: 20 June 2021 / Accepted: 09 October 2022

Abstract

Purpose: Autonomous Sensory Meridian Response is a novel phenomenon that is very popular these days on Youtube and Reddit to its anti-anxiety effects. As the name suggests, ASMR is a relaxing warm sensation that begins on the scalp and spreads throughout the body. This technique is also known as "brain massage," and it relies on soothing sights and sounds, like whispers and slow movements. Investigating these videos is primarily motivated by the desire to determine their scientific origins, which can be derived from a variety of approaches.

Materials and Methods: In this paper, we intended to examine the physiological changes such as Heart Rate (HR) as well as Galvanic Skin Conductance (GSC) levels before and after watching a single session ASMR video.

Results: The dependent t-test statistical analysis by SPSS results with P-value ≤ 0.01 indicated that after a single session of ASMR watching, the heart rate decreased significantly comparing the baseline data. In addition, the skin conductance was slightly reduced as well, but not significantly.

Conclusion: These physiological findings prove that ASMR could be an affordable, portable, and immediate anxiety relief for those struggling with anxiety-based disorders, especially for patients who do not respond well to medication or seek alternatives to anti-anxiety medications due to the wide range of side effects or would like to try it for better results along with the prescribed drugs.

Keywords: Autonomous Sensory Meridian Response; Heart Rate; Skin Conductance; Anxiety-Based Disorders; Primary Insomnia; Anti-Anxiety Methods.

1. Introduction

Anxiety disorders are the most widespread psychiatric disorders linked to a high illness burden [1]. People vary in the frequency and intensity with which they encounter it. While individuals experience anxiety usually at high intensities or under inappropriate circumstances, they may be diagnosed with an anxiety disorder such as Generalized Anxiety Disorder (GAD), panic disorder, or phobias [2]. Anxiety has been associated with an increased risk of numerous serious diseases. High anxiety was significantly linked with an increased hazard of all-cause death, cardiovascular death, and cancer death [3]. On the other hand, from the economic point of view, an anxiety-related disease represents a significant financial burden on health care systems. These days, there are various pharmacological and non-pharmacological interventions to treat anxiety. From the pharmacological perspective, Selective Serotonin Reuptake Inhibitors (SSRIs) are considered the first-line pharmacotherapy for anxiety which takes at least two weeks to show their efficiency above and beyond the side effects such as anxiety, restlessness, insomnia, dry mouth, nausea, sweating, headaches, dizziness, tremor, and sexual difficulties [4-5]. Another category named Benzodiazepines (BZs) works very fast; therefore, BZs have been used widely to treat anxiety and related disorders. Nevertheless, BZs have their specific side effects; for instance, concerning the cognitive process, BZs are identified as "acquisition impairing" molecules, and their impacts on anterograde memory processes are fully explained in [6]. Additionally, BZs use is correlated with an increased risk of Alzheimer's disease and dementia [7]. Furthermore, benzodiazepines are highly useful for some disorders, though they are potentially addictive [8-9]. Furthermore, sedation due to BZs is the contributing factor to increasing the risk of falling and other accidents, individually in the elderly [10]. To these considered side effects, some patients prefer using the more secure non-pharmacological alternatives to treat their anxiety, typified by mindfulness or brain modulation interventions. Mindfulness-based interventions, such as mindfulness-based stress reduction, have revealed consistent anxiety reduction [11]. Additionally, other anxiety-relieving methods such as Neurofeedback and Cognitive Behavioral Therapy (CBT) require multiple sessions to be effective; this can be very costly for patients because it requires multiple meetings to be effective.

Several mindfulness-based techniques have been presented to reduce anxiety [12-18]. For instance, meditation is a well-known technique that has some similarities to ASMR. In relation to meditation and physiological measures, some studies have been done. The authors of [19] examined changes in the Heart Rate Variability (HRV) during meditation. It has been found that meditation may have different effects on health based on the frequency of the resonant peak reached by the meditator. Also in [20], the researchers evaluated the effects of meditation on resting and ambulatory heart rate and blood pressure in youth. The results showed significant differences between the meditation and health education control groups in the heart rate and blood pressure between pre- and post-tests. However, it takes practice and patience to see the results. ASMR is one of the mindfulness methods, which is a unique perceptual sensation in which particular audiovisual stimuli constantly provoke tingling sensations on the scalp, partially described by a distinct subset of features correlated with mindfulness. From an evolutionary perspective, grooming and cleaning animals are frequently described as emotional expressions. ASMR triggers are primarily natural events such as whispering, personal attention, tapping, watching someone do something carefully, chewing gum, eating sounds (Mukbang), and touching the head or back are social or intimate but not sexual. Prominently, ASMR stimuli are endless; millions of stimuli are yet undiscovered. Regarding the most desirable ASMR triggers, [21] are widely considered the most widely used triggers within an online questionnaire of volunteer participants. That investigation shows that the three most favorable triggers are whispering 75%, personal attention 69%, and crisp sounds 64%, respectively. In the related study [22], Beck Anxiety Inventory [23] and self-report screening were performed to estimate the anxiety level and give insight into participants' daily mood; the results showed that 82% agreed that they used ASMR to help them better sleep, and 70% used ASMR to tackle with stress. Wang *et al.* [24] produced the ASMR sleeping pillow, which evoked a sensory phenomenon to enhance sleep quality in patients who suffered from sleep disorders and anxiety. They assessed the sleep duration as well as falling asleep between subjects. The investigations of these measures indicated that participants' sleep quantity and quality were enhanced by 60%, and this method's validity is proved. In [25], they assessed whether sensory sensitivity measures differentiated ASMR from non-ASMR responders in

addition to predicted ASMR intensity. There was a greater Interoceptive Sensitivity (IS) and body awareness among participants with stronger ASMR, as well as a greater likelihood of being classified as highly sensitive. Seifzadeh *et al.* [26] in a case report QEEG study revealed that such an increase was evident in post-ASMR in the beta1, particularly in the frontal region, Gamma1 in the central region, and Gamma2 in frontoparietal regions in both hemispheres. These results show the cognitive process, sensorimotor, and tingling sensation characteristics of ASMR. In a more comprehensive study, a 32-channel EEG was used by Fredborg *et al.* [27] to examine participants experiencing ASMR. They reported that ASMR stimuli evoked frontal-lobe alpha wave activity as well as EEG frequency bands associated with movement in ASMR-experienced participants. Moreover, the results revealed the attentional and sensorimotor phenomenology of ASMR. [28] Used an eye-tracking approach to investigating the physiology and characteristics of ASMR. This way, they estimated the pupil diameter of participants while they watched a control and an ASMR video. The results showed that pupil diameter was found to increase due to tingling sensations evoked through ASMR. In the latest study regarding ASMR and anxiety, ASMR-experiencers and non-experiencers watched an ASMR video and completed assessments of neuroticism, trait anxiety, and pre- and post-video state anxiety. ASMR-experiencers and non-experiencers showed significant differences in neuroticism, trait anxiety, and video engagement in MANCOVA. In addition, ASMR-experienced individuals reported significantly greater anxiety levels before watching the video, but this anxiety significantly decreased after watching the video, while non-experienced individuals reported no differences [29].

Many people claim that ASMR improves their sleep and reduces their anxiety, however, there is little scientific evidence to support this claim, and it is still a controversial topic. In order to prove its efficiency, some psychological and neuro-imaging studies such as fMRI and EEG have been conducted. Additionally, there are some physiological ones, such as [30], that the association between the reduction in the heart rate and an increase in skin conductance levels was established, however, the skin conductance increased contrary to their expectations, which was attributed to an arousing (not sexual) experience. To discover more about the unexpected results and fill this gap, we plan to use ASMR videos created with different triggers.

2. Materials and Methods

Participants: Ten healthy participants between 18 and 40 ($M=28.14$, $SD=3.64$) have been enrolled in the project randomly without any specific criteria. Individuals with a history of any neurologic disease, psychiatric disorders, or substance abuse were dropped out. Furthermore, all of them had no hearing and vision problems.

Tools: Subjects were attached to a digital sampling unit for the autonomic system polygraph. By this, real-time Galvanic Skin Conductance (GSC) and Heart Rate (HR) were recorded using the Vilistus DSU, UK. In addition, the devices used by participants included Samsung Galaxy A20 phone with 6.4 inches and Philips SHE 3555 headphones. First and foremost, to make a desirable ASMR video, we made 20 minutes of Mixed- ASMR video including the combination of the most popular and the most effective triggers (according to the latest related study [20]) including whispering, personal attention, crisp sounds as well as slow and repetitive movements from famous ASMRtists ("Gibi ASMR", "ASMR Darling", "Whispers Red" and "Whisper Unicorn"), if the only one particular video was selected, one participant might not like that trigger on that video, but we did this to use different triggers to satisfy different tastes. Consequently, the heart rate and skin conductance levels were measured before (as a baseline or pre-test) and immediately after the ASMR video watching (as a post-test) in the same circumstances while participants were lying in a comfortable chair in a quiet, semi-dark room. Finally, we compared before and after results to determine any changes and to find out how ASMR could be relaxing and efficient as an immediate outlet for anxiety in solely one session.

Statistical analysis: The t-test was used to analyze the data. Descriptive statistics and graphs were also reported. The following Figure 1 illustrates the entire procedure.

3. Results

The dependent t-test statistical analysis by SPSS results with P-value ≤ 0.01 revealed a significant decrease in post-test versus pre-test in the ASMR group in the heart rate (Pre: 84.28 ± 13.5 , Post: 77.59 ± 10.95). Also, there was a slight decrease in skin conductance after watching the video which was not significant (Pre: 1.03 ± 0.51 , Post: 0.92 ± 0.6). As can be seen, Figure 2 illustrates heart rate changes and Figure 3 demonstrates Skin

Conductance Changes (SCC) before and after watching the ASMR

video. There were three separate tables for the results. A descriptive statistic is presented in the first table (Table 1), a correlation is shown in the second table (Table 2), and a t-test analysis is presented in the third table (Table 3), respectively.

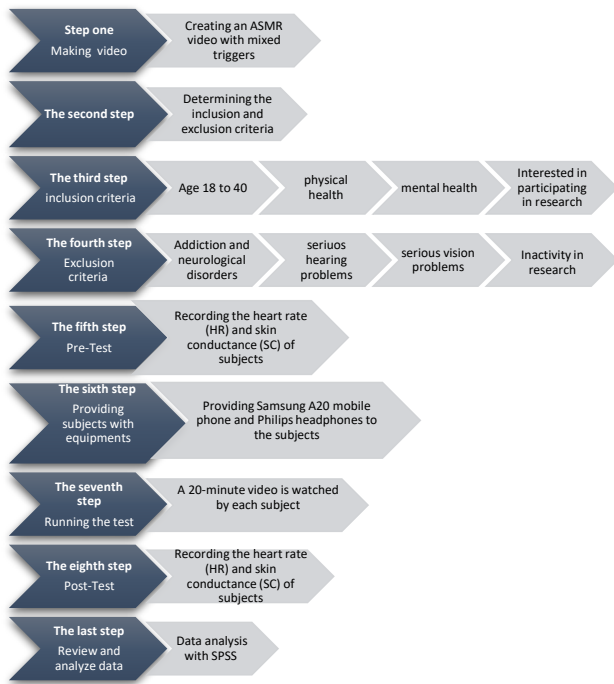


Figure 1. An overview of the project is depicted in this diagram step-by-step

Table 1. The descriptive statistic of the Pre and Post HR and SC levels

Group	N	Min	Max	Mean	SD
PRE.SC	10	.22	2.07	1.03	.51
POST.SC	10	.40	2.37	.92	.60
ASMR PRE.HR	10	68.82	108.48	84.28	13.50
POST.HR	10	61.75	98.25	77.59	10.95

Table 2. Paired sample correlation before and after ASMR

	N	Correlation	Sig.
Pair 1 PRE.SC & POST.SC	10	.245	.495
Pair 1 PRE.HR & POST.HR	10	.794	.006

Table 3. T-Test data before and after ASMR

		t	df	Sig. (2-tailed)
Pair 1	PRE.SC - POST.SC	.469	9	.650
Pair 1	PRE.HR & POST.HR	2.574	9	.030

A comparison of the heart rate before and after watching the ASMR video can be seen in Figure 2. Compared to the pre-test, there is a significant decline in the post-test.

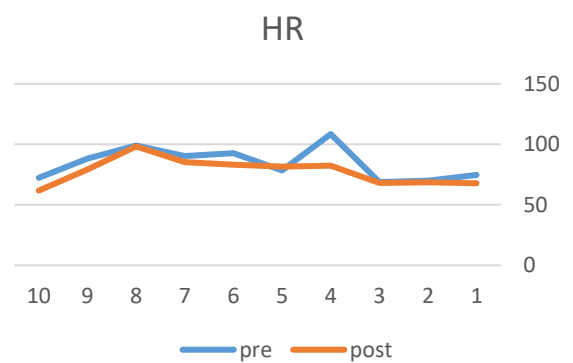


Figure 2. Heart Rate (HR) changes before and after ASMR

According to Figure 3, skin conductance changes after watching the ASMR video are compared to those before. A slightly reduced skin conductance was observed after watching the video, but it was not significant.

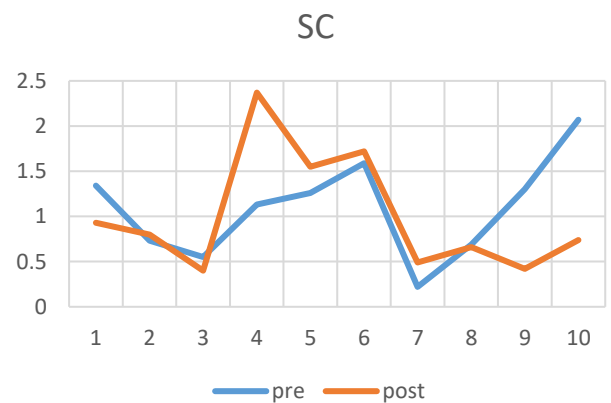


Figure 3. Skin Conductance Changes (SCC) before and after ASMR

4. Discussion

We examined the physiological bases of anxiety such as HR and SC which are enough to prove anxiety reduction. The heart rate increases during relaxing and recovering activities and decreases during stress. On the other hand, sweating is controlled by the sympathetic nervous system, and skin conductance is an indication of psychological or physiological arousal. If the sympathetic branch of the autonomic nervous system is highly aroused, then sweat gland activity also increases, which in turn increases skin conductance. The results indicated that the heart rate decreased significantly in the ASMR group. In [30], ASMR participants revealed significantly greater decreases in the heart rate after watching ASMR videos than non-ASMR participants as well. This finding is similar to this previous study in this case. Another result indicated that the skin conductance of the ASMR group diminished as well but not significantly. They expected both the heart rate and skin conductance to reduce, but the skin conductance increased against their expectations, and they claimed that this might be rooted in an arousing (not sexual) experience. In some papers, ASMR is compared to chills, but this physiological response profile differs from that of aesthetic chills, which are linked with increased heart rate [31-34].

Limitations

The first limitation is that ASMR is very novel; therefore, most of our participants were unfamiliar with that; another limitation would be the lack of physiological studies to compare our results. A larger sample size would improve these analyses' strength, undoubtedly. The lack of high-tech tools could also be a limitation. For instance, 3D tools might enhance ASMR quality and improve the results. In future research, we hope to find more participants who are experiencing ASMR. Also, ASMR efficiency might also be boosted by virtual reality (VR). As a result, VR could help subjects feel more connected to ASMRtists and the positions they take.

As part of further research on the physiological basis of ASMR, it would be helpful to measure the cortisol levels and blood pressure before and after ASMR. Furthermore, it would be interesting to compare ASMR with other brain stimulation techniques such as Transcranial Direct Current

Stimulation (tDCS) or Transcranial Magnetic Stimulation (TMS). In addition to investigating the physiological root of ASMR, we can use high-level technologies such as Electroencephalogram (EEG), functional Near-Infrared Spectroscopy (fNIRS), functional Magnetic Resonance Imaging (fMRI), and Magnetoencephalography (MEG) to examine the above in greater depth.

References

- 1- Dan Chisholm *et al.*, "Scaling-up treatment of depression and anxiety: a global return on investment analysis." *The Lancet Psychiatry*, Vol. 3 (No. 5), pp. 415-24, (2016).
- 2- David H Barlow, Anxiety and its disorders: The nature and treatment of anxiety and panic. *Guilford press*, (2004).
- 3- Glenn V Ostir and James S Goodwin, "High anxiety is associated with an increased risk of death in an older tri-ethnic population." *Journal of Clinical Epidemiology*, Vol. 59 (No. 5), pp. 534-40, (2006).
- 4- Daniel A Geller and John March, "Practice parameter for the assessment and treatment of children and adolescents with obsessive-compulsive disorder." *Journal of the American Academy of Child & Adolescent Psychiatry*, Vol. 51 (No. 1), pp. 98-113, (2012).
- 5- Antona J Wagstaff, Susan M Cheer, Anna J Matheson, Douglas Ormrod, and Karen L Goa, "Spotlight on paroxetine in psychiatric disorders in adults." *CNS drugs*, Vol. 16 (No. 6), pp. 425-34, (2002).
- 6- Daniel Beracochea, "Anterograde and retrograde effects of benzodiazepines on memory." *TheScientificWorldJOURNAL*, Vol. 6pp. 1460-65, (2006).
- 7- Sophie Billioti De Gage *et al.*, "Benzodiazepine use and risk of Alzheimer's disease: case-control study." *Bmj*, Vol. 349p. g5205, (2014).
- 8- Cecile Denis, Melina Fatseas, Estelle Lavie, and Marc Auriacombe, "Pharmacological interventions for benzodiazepine mono-dependence management in outpatient settings." *Cochrane Database of Systematic Reviews*, (No. 3), (2006).
- 9- Charles P O'Brien, "Benzodiazepine use, abuse, and dependence." *J Clin Psychiatry*, Vol. 66 (No. Suppl 2), pp. 28-33, (2005).
- 10- Antoine Pariente, Jean-Francois Dartigues, Jacques Benichou, Luc Letenneur, Nicholas Moore, and Annie Fourier-Réglat, "Benzodiazepines and injurious falls in community dwelling elders." *Drugs & aging*, Vol. 25 (No. 1), pp. 61-70, (2008).
- 11- Judson A Brewer, Alexandra Roy, Alana Deluty, Tao Liu, and Elizabeth A Hoge, "Can mindfulness mechanistically target worry to improve sleep disturbances? Theory and

- study protocol for app-based anxiety program." *Health Psychology*, Vol. 39 (No. 9), p. 776, (2020).
- 12- Álvaro Orosa-Duarte *et al.*, "Mindfulness-based mobile app reduces anxiety and increases self-compassion in healthcare students: a randomised controlled trial." *Medical teacher*, Vol. 43 (No. 6), pp. 686-93, (2021).
 - 13- Sapna Oberoi *et al.*, "Association of mindfulness-based interventions with anxiety severity in adults with cancer: a systematic review and meta-analysis." *JAMA network open*, Vol. 3 (No. 8), pp. e2012598-e98, (2020).
 - 14- Xiang Zhou *et al.*, "Effects of mindfulness-based stress reduction on anxiety symptoms in young people: A systematic review and meta-analysis." *Psychiatry Research*, Vol. 289p. 113002, (2020).
 - 15- Sebastian B Gaigg *et al.*, "Self-guided mindfulness and cognitive behavioural practices reduce anxiety in autistic adults: A pilot 8-month waitlist-controlled trial of widely available online tools." *Autism*, Vol. 24 (No. 4), pp. 867-83, (2020).
 - 16- Kevin Nolet, Giulia Corno, and Stéphane Bouchard, "The adoption of new treatment modalities by health professionals and the relative weight of empirical evidence in favor of virtual reality exposure versus mindfulness in the treatment of anxiety disorders." *Frontiers in human neuroscience*, Vol. 14p. 86, (2020).
 - 17- Feng-Ying Huang, Ai-Ling Hsu, Yi-Ping Chao, Chloe Mu-Hsuan Shang, Jaw-Shiun Tsai, and Changwei W Wu, "Mindfulness-based cognitive therapy on bereavement grief: Alterations of resting-state network connectivity associate with changes of anxiety and mindfulness." *Human brain mapping*, Vol. 42 (No. 2), pp. 510-20, (2021).
 - 18- Sarah Strohmaier, Fergal W Jones, and James E Cane, "Effects of length of mindfulness practice on mindfulness, depression, anxiety, and stress: A randomized controlled experiment." *Mindfulness*, Vol. 12 (No. 1), pp. 198-214, (2021).
 - 19- Sukanya Phongsuphap, Yongyuth Pongsupap, Pakorn Chandanamatta, and Chidchanok Lursinsap, "Changes in heart rate variability during concentration meditation." *International journal of cardiology*, Vol. 130 (No. 3), pp. 481-84, (2008).
 - 20- Vernon A Barnes, Harry C Davis, James B Murzynowski, and Frank A Treiber, "Impact of meditation on resting and ambulatory blood pressure and heart rate in youth." *Psychosomatic medicine*, Vol. 66 (No. 6), pp. 909-14, (2004).
 - 21- Emma L Barratt, Charles Spence, and Nick J Davis, "Sensory determinants of the autonomous sensory meridian response (ASMR): understanding the triggers." *PeerJ*, Vol. 5p. e3846, (2017).
 - 22- Emma L Barratt and Nick J Davis, "Autonomous Sensory Meridian Response (ASMR): a flow-like mental state." *PeerJ*, Vol. 3p. e851, (2015).
 - 23- Aaron T Beck, Norman Epstein, Gary Brown, and Robert A Steer, "An inventory for measuring clinical anxiety: psychometric properties." *Journal of consulting and clinical psychology*, Vol. 56 (No. 6), p. 893, (1988).
 - 24- Miao Wang and Bo Li, "Research on the Application of ASMR in the Development and Design of Sleeping Products." in *E3S Web of Conferences*, (2020), Vol. 179: *E3S Web of Conferences*, p. 02061.
 - 25- Giulia L Poerio, Safiyya Mank, and Thomas J Hostler, "The awesome as well as the awful: Heightened sensory sensitivity predicts the presence and intensity of Autonomous Sensory Meridian Response (ASMR)." *Journal of Research in Personality*, Vol. 97p. 104183, (2022).
 - 26- Sahar Seifzadeh, Sarani Ebrahim Moghimi, Fatemeh Torkamani, and Negar Ahsant, "Cortical activation changes associated with autonomous sensory meridian response (asmr): Initial case report." (2021).
 - 27- Beverley Katherine Fredborg, Kevin Champagne-Jorgensen, Amy S Desroches, and Stephen D Smith, "An electroencephalographic examination of the autonomous sensory meridian response (ASMR)." *Consciousness and Cognition*, Vol. 87p. 103053, (2021).
 - 28- Niilo V Valtakari, Ignace TC Hooge, Jeroen S Benjamins, and Anouk Keizer, "An eye-tracking approach to Autonomous sensory meridian response (ASMR): The physiology and nature of tingles in relation to the pupil." *PLoS one*, Vol. 14 (No. 12), p. e0226692, (2019).
 - 29- Charlotte M Eid, Colin Hamilton, and Joanna MH Greer, "Untangling the tingle: Investigating the association between the Autonomous Sensory Meridian Response (ASMR), neuroticism, and trait & state anxiety." *PLoS one*, Vol. 17 (No. 2), p. e0262668, (2022).
 - 30- Giulia Lara Poerio, Emma Blakey, Thomas J Hostler, and Theresa Veltri, "More than a feeling: Autonomous sensory meridian response (ASMR) is characterized by reliable changes in affect and physiology." *PLoS one*, Vol. 13 (No. 6), p. e0196645, (2018).
 - 31- Oliver Grewe, Reinhard Kopiez, and Eckart Altenmüller, "The chill parameter: Goose bumps and shivers as promising measures in emotion research." *Music Perception*, Vol. 27 (No. 1), pp. 61-74, (2009).
 - 32- Mathias Benedek and Christian Kaernbach, "Physiological correlates and emotional specificity of human piloerection." *Biological psychology*, Vol. 86 (No. 3), pp. 320-29, (2011).
 - 33- Anne J Blood and Robert J Zatorre, "Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion." *Proceedings of the national academy of sciences*, Vol. 98 (No. 20), pp. 11818-23, (2001).
 - 34- Joke Bradt, Cheryl Dileo, and Noah Potvin, "Music for stress and anxiety reduction in coronary heart disease patients." *Cochrane Database of Systematic Reviews*, (No. 12), (2013).